

Invisible Lines: How Bank Networks Shape the Real Effects of Supervision*

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Abstract

When supervision tightens, do bank owners adjust through connected firms? We study Russian banks around entry into the top quartile of predicted licence-revocation risk, linking bank accounts, ownership records and firm statements. Bank balance-sheet paths differ with pre-existing network reach. The current sibling direct-share measure rises by 0.74 percentage points over eight quarters; other ownership margins are inconclusive. Firm accounts provide only partial corroboration. The estimates suggest adjustment in owners' portfolios but do not establish transfers beyond supervision. Retrospective score construction and differences across the current samples limit causal interpretation.

JEL classifications: D22, D85, G21, G28, G32, G33.

Keywords: Bank supervision, Licence revocation, Ownership networks, Related parties, Tunnelling, Event study, Russia.

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1 Introduction

When a bank comes under supervisory pressure, its owners may respond beyond the bank’s balance sheet. Firms connected through ownership can supply capital, acquire assets, or reorganize their claims on the bank and other group members. These adjustments may strengthen the bank, but they may also preserve owners’ interests while weakening the protection available to its creditors. Research on related lending and tunnelling shows why the interests of controlling owners and outside investors need not coincide ([Laeven, 2001](#); [La Porta et al., 2003](#); [Johnson et al., 2000](#)). Understanding how this conflict plays out under supervisory pressure requires observing the bank together with its corporate ownership network.

We ask whether pre-existing ownership networks shape the adjustment of banks facing elevated revocation risk. Ownership is a natural place to look: the relationship between bank regulation and risk-taking depends on who controls the bank ([Laeven and Levine, 2009](#)). We first compare balance-sheet responses across banks with different network reach. We then examine how ownership changes below the bank, above it, and in firms connected through common owners. Finally, we investigate whether these changes coincide with changes in the balance sheets of connected firms. Together, these comparisons locate adjustment within the corporate group and assess whether the observed patterns are consistent with support for the bank or with the preservation of owners’ claims elsewhere. Ownership percentages alone cannot distinguish these mechanisms, which is why we study stakes alongside financial statements.

Russia provides a setting in which bank enforcement and corporate ownership can be studied jointly. The period following the 2013 change in central-bank leadership saw a sustained campaign of licence revocation and the disclosure of losses at closed banks ([Mamonov, 2023](#)). Among banks whose accounts we observe, the number fell from 937 in June 2013 to 448 in June 2019; this decline includes exits other than revocation. Ownership links are economically relevant in this setting: earlier work documents insider lending, and more recent evidence associates lending to shareholders with bank failure ([Laeven, 2001](#); [Barajas et al., 2023](#)). Historical ownership records allow us to trace those connections beyond the bank itself. Linking them to financial statements makes it possible to observe adjustment within the bank and elsewhere in its corporate group. The setting is therefore especially informative about bank–corporate groups; the magnitude of the responses need not extend to systems with different ownership

and resolution arrangements.

We link quarterly bank financial statements and licence outcomes to historical ownership relations and the annual accounts of connected firms. The combined ownership and political-relations graph contains roughly 240,000 entities, reconstructed quarterly by following links above and below banks; only ownership edges enter the stake measures. From direct shares, we compute integrated stakes that account for chains of intermediate holdings, drawing on the ownership-network approach of [Elliott et al. \(2014\)](#). We stop each chain at the first bank it reaches, so that a firm held through a bank is attributed to that bank rather than to an owner further up the chain. This construction distinguishes three margins: a bank’s holdings in firms, corporate holders’ stakes in the bank, and bank owners’ holdings in sibling firms outside the bank’s downstream ownership tree. The firm accounts then let us ask whether a change in these claims accompanies a change in the assets, liabilities or equity of the firms concerned.

We summarize observable bank vulnerability using a model of subsequent licence revocation. Russian failure-prediction studies show that public accounts contain information about licence withdrawal, while credit ratings only partly anticipate the supervisor’s decisions ([Peresetsky, 2011](#); [Zhivaikina and Peresetsky, 2017](#)). Each quarter, we estimate a bank’s probability of losing its licence within the following six quarters and define the danger zone as the top quartile of predicted risk. We follow banks from their first entry and compare subsequent outcome changes with changes among eligible units whose associated bank has not yet entered, using the dynamic difference-in-differences estimator of [de Chaisemartin and D’Haultfoeulle \(2024\)](#). The comparison is within business-profile groups for banks and within sector and legal-type groups for ownership pairs and firms. Pre-entry estimates show whether the groups were already moving differently. Because predicted risk also reflects a bank’s underlying deterioration, entry is a marker of elevated revocation risk rather than an observed inspection or an exogenous supervisory shock. The current score is retrospective, and the existing runs differ in some event and sample definitions; these limits qualify the comparisons below.

The current estimates reveal three patterns. First, network-poor banks contract after entry, whereas network-rich banks expand and shift towards corporate lending and deposits and away from households. This contrast is descriptive: several outcomes move before entry, and the difference between the two groups has not yet been formally tested. Second, the clearest ownership

movement is in sibling firms. The reported sibling-share measure rises by an entrant-weighted average of 0.74 percentage points over the eight quarters from entry. Its joint post-entry test has a p -value of 0.019, rising to approximately 0.06 after a simple adjustment for the three ownership margins.¹ Corporate holders' stakes in banks and banks' stakes in downstream firms are less conclusive; in particular, the current ownership windows do not reliably capture full divestments. Third, the available downstream- and sibling-firm estimates show no statistically clear average total-asset response. Downstream firms contract at later horizons, while sibling book equity rises, although pre-entry movements qualify the interpretation of the latter.

These findings provide partial, rather than complete, evidence of adjustment across the corporate group. An owner can raise a stake by buying existing shares without adding resources to the firm; likewise, a bank can expand corporate lending to firms outside its ownership network. The bank, stake and firm estimates therefore need not move together, and they do not trace the two sides of an observed transfer. The evidence is consistent with owners reorganizing their claims around elevated revocation risk, but it does not establish asset shielding, tunnelling, or a causal effect of supervision. The contribution is to identify where ownership adjustment appears and to relate it to the financial positions of the bank and its connected firms.

Our analysis connects this ownership margin to the literature on regulatory forbearance. Research explains why regulatory incentives and the costs of closure can keep weak banks operating (Boot and Thakor, 1993; Acharya and Yorulmazer, 2007; Morrison and White, 2013; Kang et al., 2015), and documents how intervention varies with banking-system weakness and supervisory institutions (Brown and Dinc, 2011; Agarwal et al., 2014). Work on Japan shows how lending to weak borrowers can delay restructuring and harm healthy firms (Peek and Rosengren, 2005; Caballero et al., 2008); Acharya et al. (2022) review the broader evidence. These studies motivate the benefits of addressing weak banks. We ask how the surrounding ownership structure accompanies adjustment when a bank faces a greater prospect of closure.

The clean-up and supervision literature shows why that adjustment need not take a single form. Poor examination ratings can constrain lending (Kupiec et al., 2017), while stricter supervision and on-site inspections can improve lending practices and the allocation of credit (Granja and Leuz, 2024; Passalacqua et al., 2021). Yet recognizing losses does not automatically

¹The current sibling outcome is the largest direct share held by a bank owner in each sibling firm-quarter. It has not yet been rebuilt as the owner-firm integrated stake used in the intended common design; Section 4 distinguishes the available estimates from that design.

bring new capital: [Chopra et al. \(2021\)](#) document adverse lending responses to India’s asset-quality review in the absence of adequate recapitalization. Higher capital requirements can induce banks to reduce assets ([Gropp et al., 2018](#)), and capital pressure can also redirect lending towards distressed borrowers with underreported losses ([Blattner et al., 2023](#)). We complement these analyses of bank and borrower adjustment by tracing equity claims held by the bank, claims on the bank, and claims held elsewhere by its owners. This perspective adds an observable margin through which a corporate group may respond even when changes in bank lending alone are ambiguous.

Finally, we connect related-party finance to adjustment across organizational boundaries. Research on related lending establishes the importance of connections between banks and their owners ([Laeven, 2001](#); [La Porta et al., 2003](#)), while evidence on regulatory leakage shows that credit can shift towards institutions outside the reach of a particular regulatory requirement ([Aiyar et al., 2014](#)). Our focus is the reorganization of ownership claims within the group surrounding a bank. Following those claims jointly with firm accounts helps distinguish a change in ownership from a change in resources, without presuming that every reorganization circumvents supervision, while the ownership graph information, the integrated stakes and the financial statements of connected firms allow us to examine the owners’ portfolios alongside the bank whose risk defines the event.

Section 2 describes the enforcement setting and the ownership channels. Section 3 presents the linked data and measurement choices. Section 4 combines the empirical comparisons and results, and Section 5 concludes.

2 Institutional background

2.1 Supervision and bank exit

Russia’s post-2013 banking clean-up provides the setting for our analysis. Following Elvira Nabiullina’s appointment as Governor of the Bank of Russia in June 2013, enforcement placed renewed emphasis on banks’ financial condition and the reliability of their reporting. Evidence from this episode documents the importance of previously concealed losses and the adjustment of bank balance sheets ([Mamonov, 2023](#)). We use 2013Q2 to mark the change in institutional

context, while dating the empirical events separately for each bank.

The number of publicly reporting banks in our data falls from 937 in June 2013 to 448 in June 2019. This decline is not a count of punitive closures: licence revocations, mergers and other exits all affect the reporting population. Nor does licence revocation necessarily coincide with the dissolution of the legal entity. The distinction matters because an entity can continue to appear as an owner after it has ceased to operate as a bank.

The clean-up also overlapped with major macroeconomic and financial disturbances. Comparisons within the same period help separate common changes from bank-specific adjustment, but cannot isolate supervision from differences in bank vulnerability. In particular, a high predicted revocation probability can reflect worsening fundamentals as well as exposure to enforcement. The danger zone is therefore a risk marker, not a direct observation of supervisory action.

2.2 Why ownership links matter

Related ownership can create incentives both to support a bank and to move resources away from it. Evidence on Russian bank ownership and lending motivates looking beyond the bank's own accounts (Laeven, 2001; Barajas et al., 2023). An owner can inject capital, change the composition of its holdings, or reorganise claims among affiliated entities. These responses have different implications even when they accompany similar improvements in reported bank ratios.

The relevant ownership links run in three directions: firms held by a bank, corporate firms that hold the bank, and sibling firms held by the bank's owners. The last group lies outside the bank's downstream ownership tree, but that position alone does not establish that it is outside every legal supervisory perimeter. Ownership data reveal claims and changes in claims; they do not establish the price, financing or purpose of the underlying transaction. Linking these records to bank and firm accounts lets us examine the associated balance-sheet changes while keeping that distinction explicit.

3 Data description

3.1 Bank-level data

3.1.1 Data sources

We use several sources of statistics at the bank level. First, data on bank misreporting come from official press releases of the CBR (“*Vestnik Banka Rossi*”) from 2007 till mid-2019. These data show which banks the CBR closed for misreporting and the size of the associated losses, the hidden negative capital that the closures revealed. Second, we collect all relevant data on bank assets and liabilities from monthly balance sheets (“*Form 101*”) and data on bank income and expenses from quarterly profit and loss accounts (“*Form 102*”), which were freely disclosed through the CBR website from 2004 to 2022.² Publishing these forms is not mandatory for banks; however, from 2007 (the first year of the misreporting records), these forms covered about 95% of the Russian banking system’s total assets. Third, the dates of license revocation and of voluntary liquidation come from the Bank of Russia’s records of credit institutions.

The bank exercise focuses on institutions exposed to license-revocation risk, while the descriptive ownership graph retains large state-controlled and systemic banks. The existing bank, ownership and firm runs do not yet apply a common exclusion rule for these institutions; their samples should therefore not be treated as identical. For each relative bank indicator, we win-sorise observations at the first and ninety-ninth percentiles within each quarter. Bank size is measured by log total assets.

The reporting sample contains 925 banks in January 2007, 937 in June 2013 and 448 in June 2019. The fall in this count includes mergers and other exits as well as license revocations. Source coverage differs: bank statements span 2004–2022, misreporting records run from 2007 to mid-2019, the danger-zone score grid covers 2009Q1–2019Q3, and the historical graph spans 2004Q1–2025Q3. These are source windows, not a common estimation period. Outcome availability and event-window requirements determine each estimation sample; later accounts do not extend the period over which new bank events can be dated. Table 2 describes the existing samples.

²The forms can be accessed through https://www.cbr.ru/banking_sector/otchetnost-kreditnykh-organizatsiy/.

3.1.2 The danger zone: a predicted-revocation marker

We use predicted license-revocation risk to locate periods when a bank is vulnerable to closure. The score summarizes information in public bank accounts; it does not reveal the supervisor’s decision rule, an inspection date, or the information available to bank owners. The reference specification predicts revocation over the following six quarters and defines high risk relative to other banks in the same quarter.

Predicted probabilities. We model the probability that a bank loses its licence within the next h quarters as

$$\Pr(\text{Revoked}_{b,t}^h = 1) = F(\alpha + \beta' x_{b,t}), \quad (1)$$

where F is the logistic function, $\text{Revoked}_{b,t}^h$ indicates licence revocation in quarters $t+1, \dots, t+h$, and the predictors $x_{b,t}$ summarise the bank’s size and financial condition. Rather than estimating equation (1) once, we re-estimate it every quarter on the W quarters that precede it and score each bank with observed predictors using the coefficients from that window:

$$\hat{p}_{b,t}^h = F(\hat{\alpha}_{[t-W, t-1]} + \hat{\beta}'_{[t-W, t-1]} x_{b,t}), \quad (2)$$

where the subscript $[t-W, t-1]$ marks coefficients estimated on quarters $t-W$ through $t-1$, where $W = 12$. The outcome windows of these training quarters can extend beyond t , so the score is a retrospective risk measure, not a real-time forecast. A real-time version would estimate the coefficients on quarters $t-W-h+1$ through $t-h$, whose outcome windows have closed by t . The figures have not been re-estimated with that restriction.

Relative risk. Let $\mathcal{R}_t$ denote banks scored in quarter t . The danger-zone indicator is

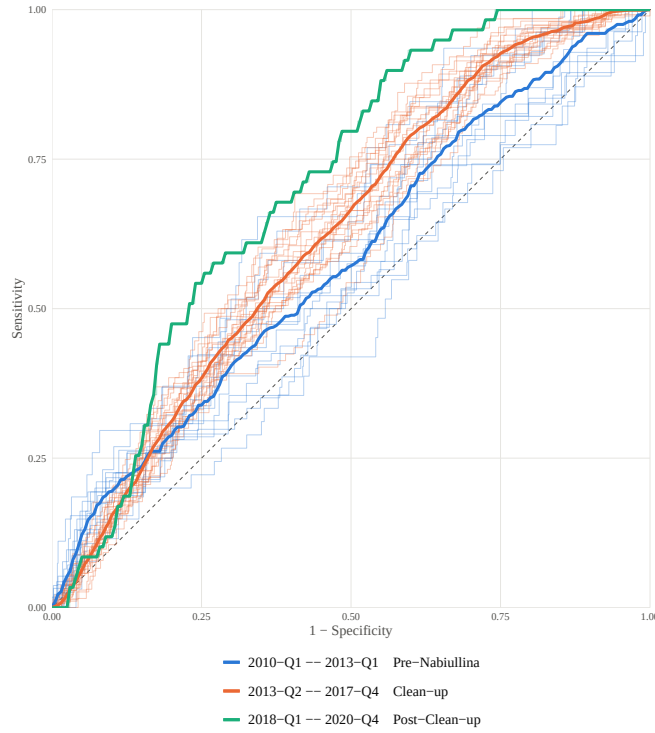
$$\text{Danger Zone}_{b,t} = \mathbf{1}\{\hat{p}_{b,t}^h \geq \text{Cutoff}_t\}, \quad \text{Cutoff}_t = Q_{0.75}(\hat{p}_{b',t}^h). \quad (3)$$

The cutoff is the within-quarter seventy-fifth percentile; ties can put more than one quarter of scored banks in the zone. It measures relative risk, not a fixed absolute probability of closure. For an unscored bank the indicator is undefined. Some existing ownership runs instead code

missing scores as zero, which can admit unclassified banks to the comparison group. This is a limitation of the current estimates, not evidence that those banks are safe.

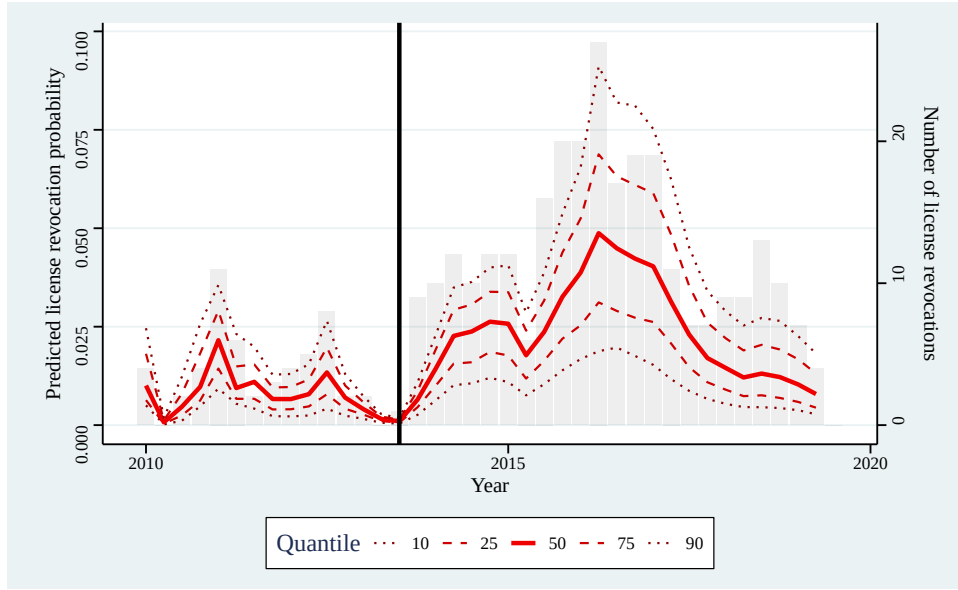
Figure 1 evaluates the six-quarter score. Figure 2 retains the earlier probability-distribution plot as a descriptive illustration; it is not a validation of a common score specification across all results. The event we study is a bank's first entry into the zone; Section 3.3 explains how this bank-specific date relates to the 2013 supervisory change, and the empirical section sets out the comparison around entry.

Figure 1. Predictive accuracy of the license-revocation score



Note: The figure shows receiver operating characteristic (ROC) curves for the predicted probability $\hat{p}_{b,t}^h$, at $h = 6$, that a bank's license is revoked in $(t, t + 6]$. For each focal quarter t , the logit is estimated on at-risk $[t - W, t)$ bank-quarters ($W = 12$) that precede t , and the fitted model assigns a probability to every bank still operating in t . Each probability is compared with the realised outcome, $\text{Revoked}_{b,t}^h$ at $h = 6$. Each thin line is the ROC curve for one focal quarter. It plots the share of subsequently revoked banks correctly flagged (true positive rate) against the share of surviving banks wrongly flagged (false positive rate) as the probability cut-off falls. Thick lines average these curves within each policy period, taking the mean true positive rate at each false positive rate. Colours mark the pre-Nabiullina period (pre-2013Q1, 13 quarters, mean AUC 0.580, range 0.51–0.66), the active bank-closure period (2013Q2–2017Q4, 19 quarters, mean AUC 0.625, range 0.57–0.67), and the later plotting bin (post-2018Q1, AUC 0.705). The dashed diagonal corresponds to random classification (AUC = 0.5). A quarter enters the figure only if it contains at least 10 revoked and 10 non-revoked banks. After 2018Q1, the six-quarter outcome window $(t, t + 6]$ extends beyond the end of the sample (2019Q3), so the later bin contributes a single eligible quarter; its broader legend dates do not imply observations throughout that interval.

Figure 2. Predicted license-revocation probabilities



Note: The lines show selected cross-bank percentiles of the predicted probabilities in the earlier scoring run; the thick line is the median. The bars show quarterly license revocations. The vertical line marks 2013Q3, the first full quarter after the June 2013 change in CBR leadership. This descriptive figure retains the original score and plotting filters and should not be read as the distribution of the six-quarter specification in Figure 1.

3.2 The ownership network

The network measures are built from ownership data drawn from the Unified State Register of Legal Entities (EGRUL), maintained by the Federal Tax Service of Russia (FTS).³ The register provides historical ownership disclosures, although coverage varies by legal form and is incomplete for some joint-stock companies. An absent recorded owner does not establish that a firm is widely held or independent. For each ownership relation the register reports the identifiers of both parties, the counterparty's type (legal entity, individual entrepreneur, or natural person), either the owned *share* in per cent or the contributed *amount* in roubles or both, and the interval over which the relation was valid. For every entity we collect both directions of the relation: the firms it owns and the entities that own it. The taxpayer identifier (INN) is the key throughout, and it is the key on which the firm statements of Section 3.6 are also filed, so account links use identifiers rather than approximate company-name matching; this does not guarantee complete coverage. The data covers 2004Q1–2025Q3.⁴

³<https://egrul.nalog.ru/index.html>

⁴All event dates in the raw register are floored to the start of the calendar quarter, aggregating the daily records to the quarterly frequency of the panel.

Construction. The register is read by web-crawling each entity’s ownership page. Rather than reconstruct the full national graph each quarter, we expand each *bank*’s ego network outwards to the fourth network “handshake,” in both directions.⁵ The combined graph, including the political and other ties described in Section 3.5, holds 23,802,567 edge-quarters over 240,078 nodes. Only ownership edges enter the stake calculations.⁶

Imputing missing shares. The direct share $\text{DirectShare}_{i \rightarrow j, t}$, the share of j held directly by i in quarter t , depends on which of the two size fields the register carries. A recorded share is taken as filed. Where only a contributed amount is recorded, the share is that amount divided by charter capital: for a participation record, the charter capital of the owned company; for a founder record, the charter capital of the firm on whose register page the record appears. Where neither is recorded, the share is imputed from the constraint that the shares in any one company sum to one: the unallocated residual, one minus the sum of the shares observed for that company in that period, is divided equally among the owners whose shares are missing.⁷ Because the summing-to-one constraint holds only at the owned company, the imputation is performed from the owned company’s side for both directions of the relation, whichever direction the measure being constructed requires.

Dating ownership links. Recorded start and end dates determine each link’s quarterly history. Where an administrative closure date is available, links are truncated at the closure of either party. A missing filing is not itself evidence of legal closure, and a bank can remain a legal entity after losing its license. Missing endpoints and incomplete closure records can therefore leave stale links in the graph. These issues are separate from the estimation-window treatment of a stake that falls to zero, discussed in Section 4.2.

⁵The first handshake is the set of entities directly owned by bank b together with those directly owning it; the second is the direct counterparties of those entities, and so on to the fourth.

⁶A node is a legal entity, an individual entrepreneur, or a natural person. Individuals and individual entrepreneurs can own but cannot be owned, so they are the terminal nodes of any ownership chain and form the roots of the propagation in Section 3.4.

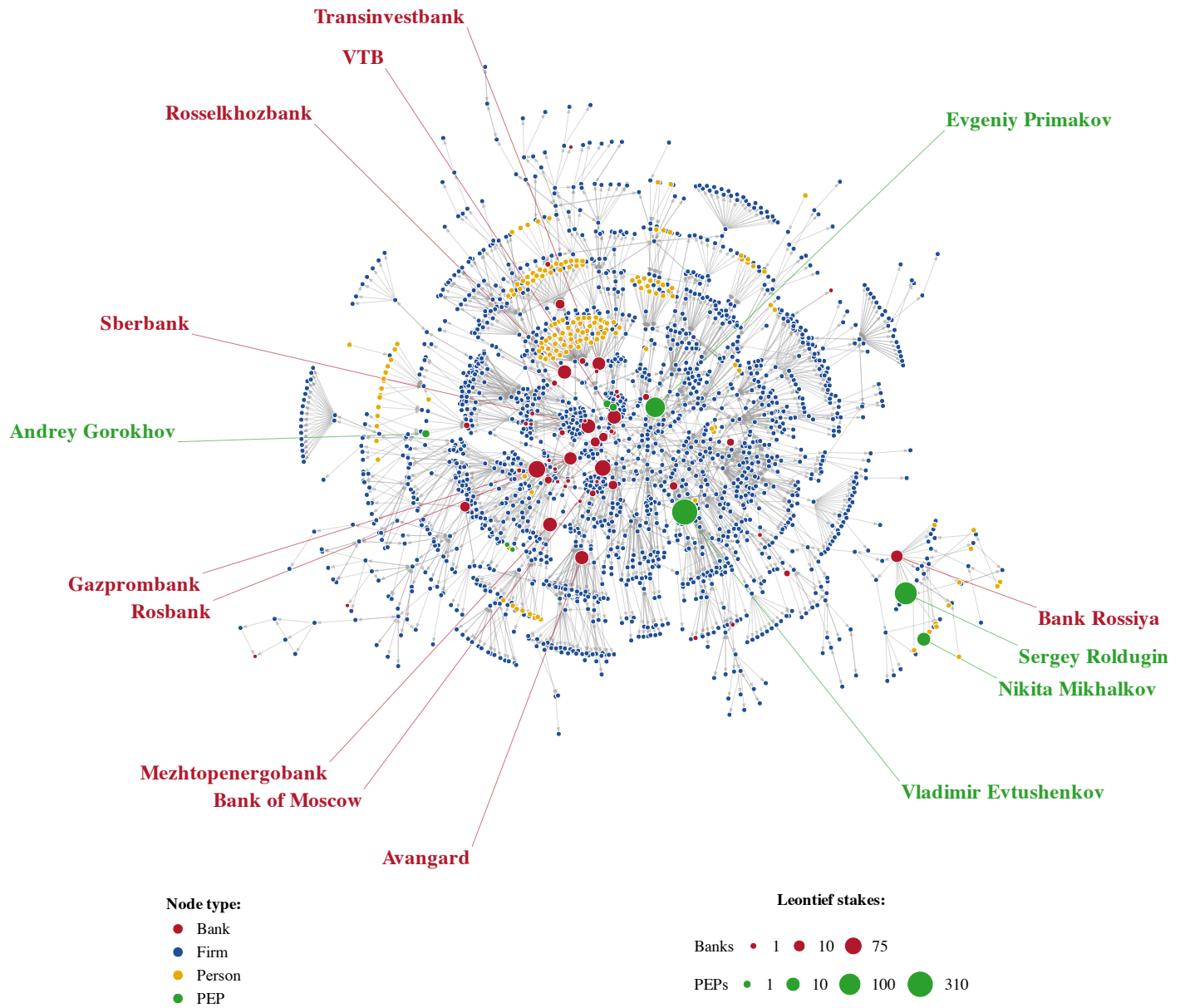
⁷For instance, firm F1 holds three participations. In firm X the register records a 50% share, which is used as filed. In firm Y no share is recorded, but the entry gives a contribution of 50 roubles and Y’s charter capital is 100 roubles, so the share is imputed as $50/100 = 50\%$. In firm Z neither a share nor an amount is recorded for F1, nor for a second owner F2, while a third owner F3 is recorded at 60%. The unallocated 40% is divided equally, giving F1 and F2 20% each. The direct shares of F1 are then 50%, 50% and 20%.

Table 1. Top and bottom 10 banks by downward stake, 2013Q1. The table reports the sum over non-bank firms of the downward stakes $\text{Stake}_{b \rightarrow f, t}$ of equation (4): the equity of non-bank firms a bank owns directly and indirectly, summed over all ownership chains (cross-holdings included); chains stop at the first bank, so a claim passing through another bank is credited to that lower bank. Units are firm-equivalents (1 = one firm wholly owned). Panel A lists the ten banks with the largest stakes and Panel B the ten with the smallest positive stakes, among the 692 banks holding any stake in 2013Q1.

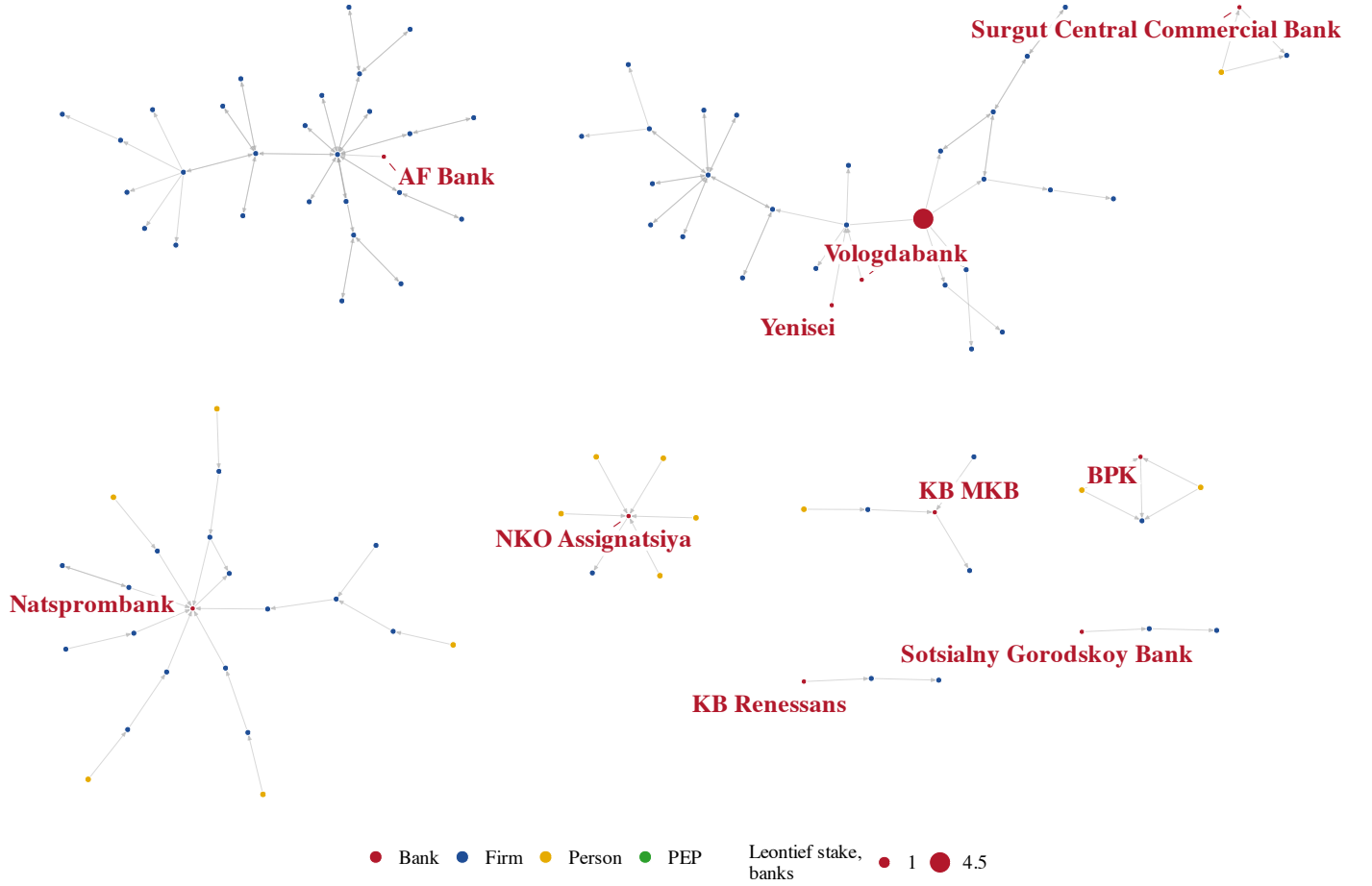
Bank	Downward stake	Firms	Nodes	Quarters	Exit
<i>Panel A: Top 10</i>					
Gazprombank	74.95	157	193	43	–
Bank of Moscow	54.09	140	674	43	–
Sberbank	30.21	154	811	43	–
Mezhtopenergobank	28.68	32	40	43	2017
Rosselkhozbank	24.79	71	100	43	–
VTB	24.00	103	702	43	–
Avangard	23.71	36	36	43	–
Transinvestbank	20.02	30	35	37	2013
Rosbank	17.21	59	536	43	–
Bank Rossiya	13.36	45	604	43	–
<i>Panel B: Bottom 10</i>					
KB Renessans	0.00754	1	3	43	2015
BPK	0.00683	1	1	36	2005 [†]
NKO Assignatsiya	0.00678	1	1	25	2014
AF Bank	0.00559	0	27	43	2014
Vologdabank	0.00506	3	15	43	2016
Yenisei	0.00506	3	15	43	2017
Sotsialny Gorodskoy Bank	0.00397	1	2	43	2011 [†]
KB MKB	0.00250	1	1	43	2016
Surgut Central Commercial Bank	0.00222	1	1	18	2015
Natsprombank	0.00170	1	1	28	2011 [†]

Notes. The stake of bank b in quarter t is the sum over non-bank firms f of $\text{Stake}_{b \rightarrow f, t}$ (equation (4)), computed from the direct shares $\text{DirectShare}_{i \rightarrow j, t}$, the share of j 's equity held directly by i . Firms: firms in which the bank's stake is at least 0.1%. Nodes: entities reachable from the bank along positive ownership links without passing through another bank. Quarters: quarters of 2010Q1–2020Q3 with a positive stake. Exit: year the banking license was revoked; [†] before 2013Q1. A legal entity outlives its banking license and can still hold stakes after the revocation.

Figure 3. Banks with the deepest and the smallest reach into the real economy, 2013Q1



(a) Top 10 banks



(b) Bottom 10 banks

Note: This figure shows the ownership ego networks, in 2013Q1, of the ten banks with the ten largest (panel (a)) and smallest (panel (b)) downward stakes, one quarter before Elvira Nabiullina’s appointment; the banks are those of Table 1. The ego network of a bank consists of the bank itself, its direct and indirect owners, and the entities it holds directly or indirectly, together with every ownership link among these nodes, as recorded by the crawl of Section 3.2, which stops at the fourth handshake. The stake by which the banks are ranked is the sum over non-bank firms of $\text{Stake}_{b \rightarrow f, t}$ of equation (4), that is, the equity of non-bank firms that a bank holds directly and indirectly along every ownership chain, where a chain stops at the first bank it reaches. Node colour indicates type: banks (red), firms (blue), individuals (gold), including politically exposed persons (PEPs) recorded in the ruPEP register (green). Grey arrows point from owner to owned. Bank circles grow with the logarithm of the bank’s downward stake and PEP circles with the logarithm of the person’s integrated stake, on two separate scales given in the legend, whereas firms and other individuals are drawn at a fixed size.

3.3 License outcomes and event timing

The 2013 supervisory change provides the institutional setting, while the empirical event is bank-specific entry into the danger zone. These dates answer different questions: the former marks a change in the enforcement environment; the latter identifies a period of elevated predicted revocation risk. Section 4 does not estimate a before–after effect of the 2013 appointment.

license revocation is distinct from voluntary liquidation, merger and legal dissolution. We retain this distinction in describing exits and do not interpret every decline in the reporting-bank count as enforcement. The closure-ground classifications of [Karas and Vernikov \(2019\)](#) distinguish financial-health and misconduct grounds; these can overlap and do not by themselves identify a transfer to an affiliated firm. Figure 1 reports revocation discrimination only, not a voluntary-liquidation placebo.

3.4 Integrated ownership stakes

A bank whose only participation is in a holding company has a claim on the firms below that holding that no single register entry records, so direct shares are the wrong object for the mechanism we study. Let $\text{DirectShare}_{i \rightarrow j, t}$ be the share of entity j held directly by entity i in quarter t , as recorded in the register (Section 3.2); here and below the arrow points from the holder to the held entity. Following [Elliott et al. \(2014\)](#), the *integrated stake* of i in j adds to the direct share every share that i holds through intermediate owners, where a chain of intermediate owners stops at the first bank it reaches:

$$\text{Stake}_{i \rightarrow j, t} = \text{DirectShare}_{i \rightarrow j, t} + \sum_{k \notin \text{banks}} \text{DirectShare}_{i \rightarrow k, t} \times \text{Stake}_{k \rightarrow j, t}, \quad (4)$$

where the sum runs over the entities k that i holds directly and that are not banks⁸. Applied along every chain, equation (4) multiplies the shares along each chain from i to j and adds up the chains. Because the sum skips banks, a chain may start or end at a bank but never passes through one: every chain stops at the first bank it reaches, and a share held through a bank is

⁸If bank b holds 50% of a holding company k and k holds 40% of firm f , the integrated stake of b in f is $0.5 \times 0.4 = 20\%$, although no register entry links b and f .

credited to that bank and to no holder above it.⁹ The integrated stake is measured in the same units as a direct share. For a bank holder it never exceeds one; it equals the direct share when no other chain connects the two entities and the held entity holds none of its own shares.

Three margins. The downward stake is a bank’s claim on a firm, $\text{Stake}_{b \rightarrow f, t}$; the upward stake is a corporate holder’s claim on a bank, $\text{Stake}_{o \rightarrow b, t}$. The corresponding sibling object would be an owner’s integrated claim on another firm outside the bank’s downstream tree. The current sibling estimate instead uses the largest direct share held by a bank owner in each sibling firm-quarter, and admits natural-person as well as corporate owners. It is not an integrated owner–firm stake. Table 1, Figure 3 and Figure 4 describe downward stakes.

Banks and cycles. The calculations use a fixed set of 1,230 bank identifiers as stopping points, irrespective of current license status. Revocation alone therefore does not move a bank’s downstream firms to the bank owner above it. The downward calculation solves the ownership system within each cross-holding block. The upward calculation first removes self-holdings and links within cross-holding cycles, and then solves on the resulting graph. The upward stake consequently omits paths retained in the downward measure. Neither construction should be read as a full consolidated cash-flow claim.

Interpretation and coverage. We measure ownership reach without the outside-owner rescaling of Elliott et al. (2014). A stake is a claim on an individual firm, not a monetary asset value, and summing it over firms gives firm-equivalents. Claims at successive non-bank levels are not value-additive. Upward stakes require a recorded corporate holder; the current sibling measure requires a recorded bank owner. Missing ownership disclosures therefore affect eligibility for these samples. Downward stakes are retained for firm-quarters in which banks jointly hold at least 0.1% of the firm, and upward stakes of at least 10^{-4} . Because the crawl stops at the fourth handshake (Section 3.2), an exact solution within the observed graph cannot recover entities or links beyond it, so stakes that run through longer chains are understated.

⁹Without the stop at banks, equation (4) gives the integrated ownership of Elliott et al. (2014). We solve the equation exactly on the observed graph, summing chains of every length rather than truncating them after a fixed number of links. The solution is unique unless a group of non-bank entities is owned entirely by its own members. For such groups, the downward calculation disregards the self-holding of an entity that owns itself fully and uses a generalised inverse for a group of several entities; these conventions are numerical and do not attribute the ultimate ownership of such groups.

Computation. The downward calculation solves the linear system on the observed graph rather than truncating the path expansion after a fixed number of links. It retains firm-quarters in which banks jointly hold at least 0.1%. The upward calculation applies a 10^{-4} stake floor after solving on its cycle-cut graph. In the downward solver, a fully self-owned node does not amplify incoming exposure, while a singular multi-entity block uses a generalized inverse. These numerical conventions do not resolve the economic indeterminacy of a closed ownership block.

The four-handshake extraction limit is a separate restriction: solving exactly within the observed graph cannot recover omitted entities or links. The estimates have not been accompanied by sensitivity results for deeper graph extraction, alternative stake floors or singular-block treatment. These limitations qualify comparisons of network reach.

Aggregation. For a future heterogeneity analysis, we propose an asset-weighted network measure: weight bank b 's downward stakes $\text{Stake}_{b \rightarrow f, t}$ in non-financial firms by those firms' total assets, scale the sum by the bank's total assets, and average the ratio over the same pre-regime window as the bank split on the trimmed graph. The current bank figures instead split banks by pre-regime out-degree, the number of firms in which they directly hold stakes (Section 4.1). The proposed measure has not been used to produce those figures.

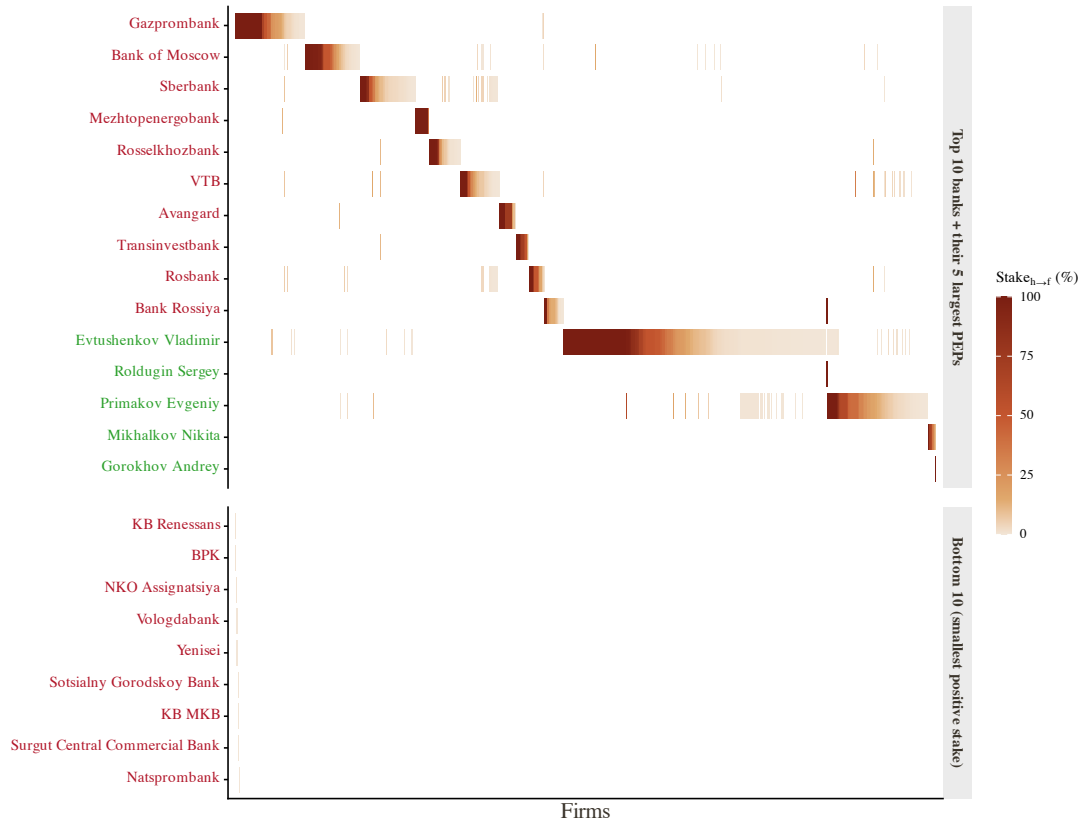
3.5 Political exposure

The Politically Exposed Persons Database (ruPEP) supplements the register with information on political connections and relations among people and organisations.¹⁰ The extracted records span 2002–2025 and contribute 5,500,304 edge-quarters, including 685,114 ownership records; the remainder concern family, management, employment and political ties. Political exposure is illustrated in the network diagrams but is not a regressor or a tested mechanism in the results reported here.

Only records classified as ownership can contribute to direct shares. Family and employment ties do not represent equity claims and are excluded from integrated stakes. Person matches use identifiers where available and names otherwise, so political annotations are subject to matching uncertainty and incomplete coverage. Absence of a recorded political tie does not establish absence of political access.

¹⁰<https://rupep.org/>

Figure 4. The bank-firm downward exposure matrix, 2013Q2



Note: This figure shows downward stakes in 2013Q1, one quarter before Nabiullina’s appointment, for the banks and politically exposed persons (PEPs) of Figure 3. The upper panel covers the ten banks with the largest downward stake in Table 1, labelled in red, and the five PEPs with the largest integrated stakes in their ego networks, labelled in green; the lower panel covers the ten banks with the smallest positive downward stake. Each cell shows the stake $\text{Stake}_{h \rightarrow f, t}$ of holder h (row) in firm f (column), computed from equation (4) with ownership chains stopped at the first bank; for a PEP, the same equation is solved with the person as the holder. The figure includes the 1,538 non-bank firms in which at least one of these holders has a stake above 0.1%, of which 1,528 appear in the upper panel and 10 in the lower one. AF Bank holds no stake above this threshold and therefore has no row. Firms are grouped under the holder with the largest stake in them and ordered by that stake within each group, so the near-diagonal blocks show that most firms are held by a single holder. Cells off the diagonal mark the 186 firms reached by more than one holder, among them 49 reached by several banks and 38 by both a bank and a PEP. A further 785 firms are reached only through the five PEPs and by none of the banks shown.

3.6 Firm-level data

Firm outcomes come from the Russian Financial Statements Database (RFSD; [Bondarkov et al., 2025](#)). Annual statements are linked to the ownership graph by taxpayer identifier and report year-end balances. The source panel used by the firm-data pipeline spans 2011–2024; the event-study samples use the observations available around dated bank events and do not identify new events after the score grid ends.

We use total assets, non-current assets, current assets, total liabilities and book equity. Amounts are in nominal thousands of roubles. Total assets enter in natural logarithms; non-current assets, current assets and liabilities use $\ln(1 + x)$, retaining zeros. The source transfor-

mation also maps missing values of these components to zero before taking logs, so a zero does not always identify a reported zero balance. Equity enters as $\text{asinh}(x)$, which accommodates zero and negative values. The plotted “ln” labels for the latter asset and liability outcomes are shorthand for $\ln(1+x)$; their coefficients are not exact percentage changes near zero. Calendar-time comparisons absorb common movements in nominal values but do not turn the outcomes into quantities of real resources. Section 4.3 distinguishes the existing linked-pair samples from the intended aggregation to firm-years.

3.7 Summary statistics

Table 2 retains the descriptive statistics of the existing estimation runs. Its bank-group labels and sample coverage are not a validation of the harmonised danger-zone design.

Table 2. Summary statistics for the existing bank, ownership and firm samples

Variable	Full sample						Bank group 0		Bank group 1		Comparison	
	N	Mean	SD	P1	Median	P99	N (0)	Mean (0)	N (1)	Mean (1)	Difference	ND
Predicted probabilities												
License Revocation, %	14065	2.2	1.9	0.0	1.7	9.0	8756	1.8	5309	2.8	1.01	0.52
Bank outcomes												
Total Assets	14076	64.8	254.9	0.1	7.2	1219.3	8764	97.1	5312	11.5	-85.64	-0.38
Household Loans	14076	10.8	62.8	0.0	0.5	171.7	8764	16.7	5312	1.2	-15.52	-0.28
Firm Loans	14076	16.5	73.1	0.0	1.7	296.1	8764	24.1	5312	4.2	-19.89	-0.3
Non-Performing Loans	14076	6.3	44.8	0.0	0.2	117.8	8764	9.0	5312	1.8	-7.11	-0.17
Total Equity	14076	5.6	28.0	-0.3	1.1	103.6	8764	8.6	5312	0.7	-7.91	-0.32
Household Deposits	14076	17.7	84.1	0.0	1.7	248.9	8764	26.0	5312	4.0	-21.96	-0.29
Firm Deposits	14076	10.7	44.3	0.0	0.9	204.8	8764	15.8	5312	2.3	-13.58	-0.34
ln Total Assets	14076	2.1	2.0	-2.2	2.0	7.1	8764	2.5	5312	1.4	-1.12	-0.63
ln Household Loans	14076	0.9	1.3	0.0	0.4	5.2	8764	1.2	5312	0.5	-0.68	-0.61
ln Firm Loans	14076	1.4	1.3	0.0	1.0	5.7	8764	1.6	5312	1.0	-0.65	-0.52
ln Non-Performing Loans	14076	0.7	1.1	0.0	0.2	4.8	8764	0.9	5312	0.3	-0.57	-0.6
ln Total Equity	13903	0.3	1.6	-3.2	0.1	4.6	8695	0.7	5208	-0.4	-1.16	-0.82
ln Household Deposits	14076	1.4	1.4	0.0	1.0	5.5	8764	1.6	5312	1.0	-0.65	-0.49
ln Firm Deposits	14076	1.1	1.2	0.0	0.6	5.3	8764	1.3	5312	0.6	-0.7	-0.62
Non-Performing Loans Share	14090	7.1	12.7	0.0	3.4	74.2	8771	7.7	5319	6.1	-1.67	-0.14
Capitalisation	14099	21.1	17.1	-0.7	15.3	82.2	8775	21.9	5324	19.8	-2.13	-0.13
Other bank characteristics												
ROA	14056	0.3	2.2	-4.9	0.3	5.6	8748	0.4	5308	0.1	-0.29	-0.13
Liquid Assets Share	14121	16.8	16.9	0.3	10.6	81.6	8789	17.3	5332	15.9	-1.37	-0.08
Net Interbank Loans	14097	2.1	13.3	-43.1	0.0	47.6	8775	2.1	5322	2.1	-0.02	0
Total Assets Growth	14033	2.8	15.4	-33.5	1.5	63.0	8737	2.8	5296	2.8	-0.04	0
Network variables												
Degree (Out)	12311	3.7	4.7	0.0	2.0	23.0	7662	4.3	4649	2.7	-1.56	-0.36
Strength (Out)	12311	1.4	2.3	0.0	0.6	11.1	7662	1.8	4649	0.9	-0.87	-0.41
N. of Controlled Firms	12285	1.9	4.8	0.0	0.0	30.0	7636	2.5	4649	0.9	-1.56	-0.36
1 / HHI (Out)	9836	3.0	3.0	1.0	2.0	15.8	6217	3.4	3619	2.4	-1.02	-0.37
Ownership outcomes (quarterly panels)												
Downward stake, %	823413	6.4	19.9	0.0	0.0	100.0	—	—	—	—	—	—
Upward stake, %	103009	13.3	20.4	0.0	5.9	100.0	—	—	—	—	—	—
Sibling direct share, %	150762	62.4	37.4	0.0	62.4	100.0	—	—	—	—	—	—
Exposed firms (pair-year panel)												
ln Total assets	35132	8.9	3.5	1.1	8.7	17.1	—	—	—	—	—	—
ln Non-current assets	35132	5.6	5.0	0.0	5.3	16.1	—	—	—	—	—	—
ln Current assets	35132	8.4	3.4	0.0	8.3	16.5	—	—	—	—	—	—
asinh Equity	35130	5.5	7.7	-14.2	7.6	17.0	—	—	—	—	—	—
ln Total liabilities	35132	7.4	4.0	0.0	7.5	16.1	—	—	—	—	—	—
Sibling firms (pair-year panel)												
ln Total assets	163417	10.2	3.7	2.0	10.1	18.4	—	—	—	—	—	—
ln Non-current assets	163417	7.6	5.2	0.0	8.0	18.1	—	—	—	—	—	—
ln Current assets	163417	9.5	3.6	1.1	9.5	17.3	—	—	—	—	—	—
asinh Equity	163369	6.9	8.1	-14.1	9.1	18.5	—	—	—	—	—	—
ln Total liabilities	163417	9.0	4.2	0.0	9.1	17.5	—	—	—	—	—	—

Note: Bank columns retain the grouping of the earlier run. Group 1 accounts for about 38% of these observations, so these labels cannot be equated directly with the top quartile of the current score universe. Difference and ND retain the reported mean and normalized differences; significance stars are omitted. Bank levels are in billions of roubles; total assets and positive equity use logs, and other displayed log levels use $\ln(1+x)$. The probability row retains the earlier scoring specification. P1 and P99 are percentiles. The inverse HHI uses the untrimmed graph. Ownership shares are percentages: downward and upward observations are pair-quarters, whereas the sibling outcome is the maximum direct share per firm-quarter. Firm outcomes use the transformations described in Section 3.6 and retain linked-pair-year observations. The lower panels pool cells actually retained by the respective estimators, which need not be the same across outcomes or event horizons.

4 Empirical setup and results

We examine adjustment around a bank’s first entry into the danger zone at three levels: the bank’s balance sheet, the ownership stakes that link the bank to firms, and the accounts of the firms in those ownership samples. This sequence asks whether the bank changes its business, where ownership claims move, and whether connected firms record corresponding changes in resources. Section 4.1 sets out the bank-level comparison and its results, Section 4.2 the pair-level comparison on three ownership margins, Section 4.3 the firm accounts, and Section 4.4 reads the three levels together. Throughout, entry is a marker of elevated revocation risk, not an observed inspection or an externally assigned intervention: because the score also reflects deteriorating fundamentals, a post-entry difference need not be caused by supervision. The figures show the existing runs, which use different score versions and treatment histories and still require harmonisation, so we treat the evidence as preliminary.

4.1 Bank balance sheets

Event and comparison. The event quarter E_b is the first quarter in which bank b enters the top quartile of predicted licence-revocation risk (Section 3.1.2). We compare the change in an entrant’s outcome since the quarter before entry with the corresponding change among banks of the same business profile that have not yet entered, using the dynamic difference-in-differences estimator of [de Chaisemartin and D’Haultfoeuille \(2024\)](#). The window covers the entry quarter and seven subsequent quarters, with pre-entry placebos, and the quarter before entry is the reference. Because the question is whether the ownership network changes how a bank adjusts, we split banks by their pre-regime network reach and estimate

$$Y_{b,t} = \alpha_b + \alpha_{P,t} + \sum_{\tau \neq -1} \delta_\tau \text{Danger Zone}_{b,t}^\tau \times \text{Network}_b^{\text{pre}} + \varepsilon_{b,t}, \quad (5)$$

where $Y_{b,t}$ is a balance-sheet outcome of bank b in quarter t , $\text{Danger Zone}_{b,t}^\tau$ equals one if quarter t lies τ quarters after the bank’s first entry into the danger zone, $\tau = -1$ is the omitted reference quarter, $\text{Network}_b^{\text{pre}}$ is the bank’s pre-regime network group, network-rich or network-poor, measured before the 2013 regime change, α_b are bank fixed effects and $\alpha_{P,t}$ are bank profile $\times$ quarter fixed effects, which compare each entrant with banks of the same business profile

in the same quarter. The interaction means that the event path δ_τ is estimated separately for network-rich and network-poor banks, so that an entrant is compared only with not-yet-entered banks of its own group; the gap between the two paths describes how adjustment differs with ownership reach, and a formal cross-group test is still needed to establish that the paths differ. Equation (5) describes the comparison; it is not estimated as a two-way fixed-effects regression.

In the plotted runs the network proxy $\text{Network}_b^{\text{pre}}$ is the bank’s out-degree—the number of firms in which it directly holds a stake—averaged over 2010Q2–2013Q1: banks above the 90th percentile of this average in the bank-panel data are network-rich and all other banks network-poor. This proxy is distinct from the asset-weighted network measure discussed in Section 3.4; the plots have not yet been re-estimated with that measure.

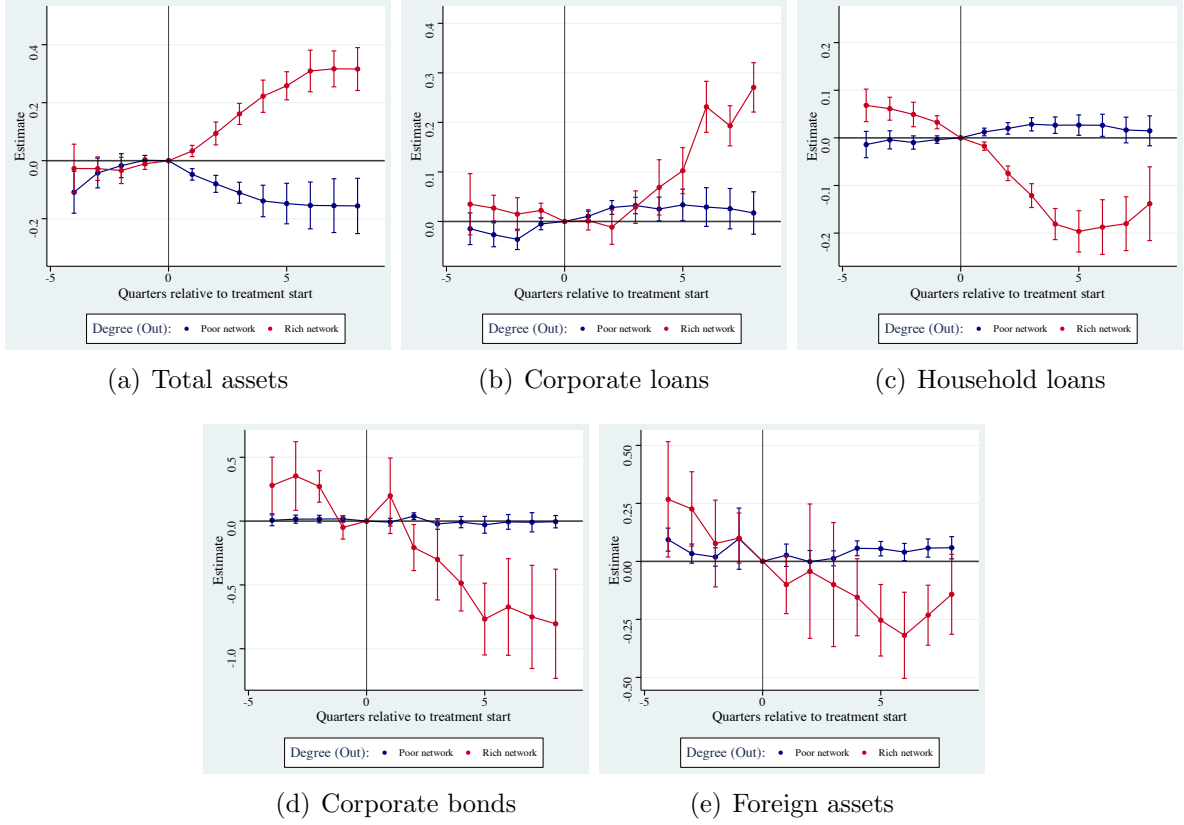
Results. Figures 5 and 6 show divergent paths in total assets: network-poor entrants contract, while network-rich entrants expand. Among the latter, corporate loans and deposits increase while household loans and deposits decline, a pattern consistent with a shift towards corporate business. The asset panels also retain corporate bonds and foreign assets; their paths help show whether the contrast is broader than lending alone. Equity is shown alongside deposits because balance-sheet growth could otherwise mask a change in capital.

These are visual comparisons, not a formal rich-minus-poor test. Several outcomes move before entry, and bank size and capitalisation help determine the score. Moreover, corporate lending in bank accounts includes firms outside the ownership network: the plots cannot show that new loans went to connected firms. The ownership analysis therefore asks where claims change, without assuming that the lending and ownership margins identify the same transactions.

4.2 Ownership stakes on three margins

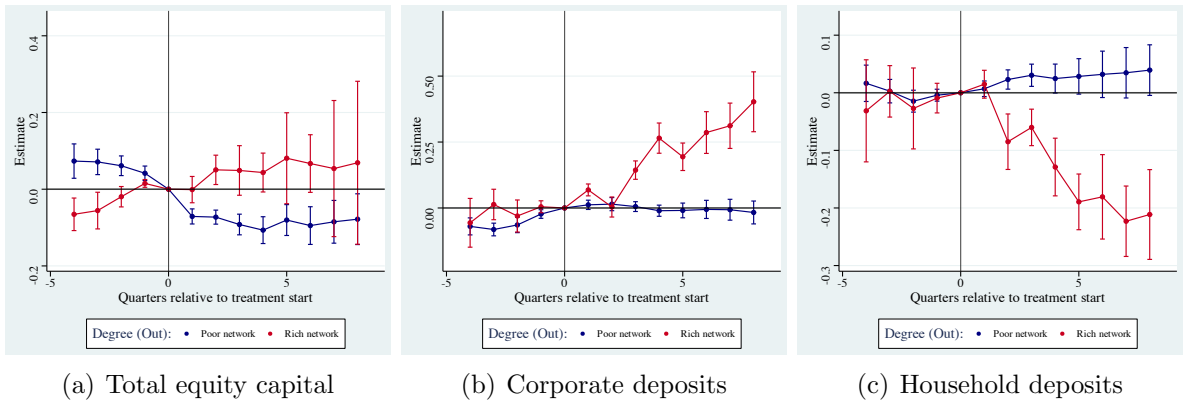
The pair-level analysis traces the integrated stake $\text{Stake}_{i \rightarrow j, t}$ of Section 3.4, the share of j that holder i owns in quarter t through all ownership chains, around the entry of the bank attached to the pair. Three margins differ only in where the pair sits relative to that bank (Table 3). On the *downward* margin the bank is the holder: $\text{Stake}_{b \rightarrow j, t}$, the bank’s stake in firm j . On the *upward* margin the bank is the held entity: $\text{Stake}_{i \rightarrow b, t}$, the stake of a corporate holder i in the bank. On the *sibling* margin neither party is the bank: i is an owner of the bank, holding at

Figure 5. Bank assets around danger-zone entry, by network group



Note: Existing bank-quarter estimates, split by pre-regime out-degree. Total assets use a four-quarter average of log assets. Other panels use the saved size-adjusted log outcomes; most are four-quarter averages, while corporate bonds and foreign assets are not. The horizontal axis uses the estimator's stored horizon: 1 is the entry quarter, 0 the omitted pre-entry reference, and negative values are pre-entry placebos. The vertical line marks the reference quarter. The split uses the pre-regime ninety-percentile rule; bands are 95% confidence intervals. These plots retain the earlier bank-treatment specification, rather than a re-estimation with the six-quarter ownership score. The gap between groups has not been formally tested.

Figure 6. Bank equity and deposits around danger-zone entry, by network group



Note: Existing bank-quarter estimates, split by pre-regime out-degree. Total assets use a four-quarter average of log assets. Other panels use the saved size-adjusted log outcomes; most are four-quarter averages, while corporate bonds and foreign assets are not. The stored horizon places entry at 1 and the omitted pre-entry reference at 0; negative values are pre-entry placebos, and the vertical line marks the reference. The split uses the pre-regime ninety-percentile rule and bands are 95% confidence intervals. These plots retain the earlier bank-treatment specification. The two group paths have not been tested against each other.

least 25% of it, and j is a *sibling*, a firm that i holds outside the bank's downstream ownership tree and in which no bank holds a stake, so the outcome is $\text{Stake}_{i \rightarrow j,t}$. A sibling is connected to the bank only through the common owner, so it can respond only through the owner, never through the bank's balance sheet.

Table 3. The three ownership margins

Margin	Holder i	Held j	Event bank $b(i, j)$	Stake
Downward	bank b	firm j	$b = i$	$\text{Stake}_{b \rightarrow j,t}$
Upward	corporate holder i	bank b	$b = j$	$\text{Stake}_{i \rightarrow b,t}$
Sibling	owner i of bank b	sibling j	earliest entrant among the banks held $\geq 25\%$ by i	$\text{Stake}_{i \rightarrow j,t}$

Note: The event is the first entry into the danger zone (Section 3.1.2) of the pair's event bank $b(i, j)$. On the sibling margin it is the earliest entry among the banks in which the owner holds at least 25%. On the upward margin the holder is any firm whose stake in the bank meets the inclusion threshold. A *sibling* of owner i is a firm that i holds outside the bank's downstream ownership tree and in which no bank holds a direct or indirect stake. All three outcomes are the stake of Section 3.4: the arrow points from the holder to the held entity, and the margins differ in where the pair sits relative to the event bank. Stakes are measured in per cent; effects on them are in percentage points. Entering pairs at the first post-entry effect number 3,764 (downward), 841 (upward) and 637 (sibling). In the current sibling run the outcome is the largest direct share held in the sibling by any owner of the bank, and the unit is the sibling firm-quarter.

For each margin the comparison is the pair-level counterpart of equation (5),

$$\text{Stake}_{i \rightarrow j,t} = \alpha_{ij} + \alpha_{SO(j),t} + \sum_{\tau \neq -1} \delta_{\tau} \text{Danger Zone}_{b(i,j),t}^{\tau} + \varepsilon_{ij,t}, \quad (6)$$

where α_{ij} are pair fixed effects, $\alpha_{SO(j),t}$ are sector $\times$ ownership type $\times$ quarter fixed effects of the owned entity j , which proxy for demand-side conditions common to firms of the same sector and ownership type in the same quarter, and $\text{Danger Zone}_{b(i,j),t}^{\tau}$ equals one if quarter t lies τ quarters after the first entry of the pair's event bank. The estimator and the window are those of Section 4.1: an entering pair is compared with pairs of the same sector and ownership type whose event bank has not yet entered, over the entry quarter, seven subsequent quarters and four pre-entry placebos. The equation is estimated separately for each margin, and the two network groups are pooled, so no network interaction appears. Because the margins are estimated separately, a change in one claim cannot mechanically be read as an offsetting change in another.

Results. Figure 7 places the three paths side by side. The clearest change is on the sibling margin: the existing run reports an entrant-weighted average increase of 0.74 percentage points

over the eight post-entry quarters, with a joint post-entry p -value of 0.019. A simple three-margin adjustment puts that p -value near 0.06. The upward stake falls by 0.31 points on average but its joint test does not reject zero; the downward stake changes little. Thus the current evidence suggests an adjustment elsewhere in owners' portfolios, while neither divestment of bank-held firms nor recapitalisation of the bank is established.

The sibling plot needs a particularly careful reading. Its current outcome is the largest *direct* share held by a bank owner in each sibling firm-quarter, not the owner-firm integrated stake defined above. The event-bank and 25% owner conditions also need to be imposed consistently on the same bank before interpreting the three margins as a harmonised design. Finally, current pair windows can end when a stake reaches zero, making full divestments hard to observe. These issues affect what the plots can establish; they are not resolved by relabelling the current series.

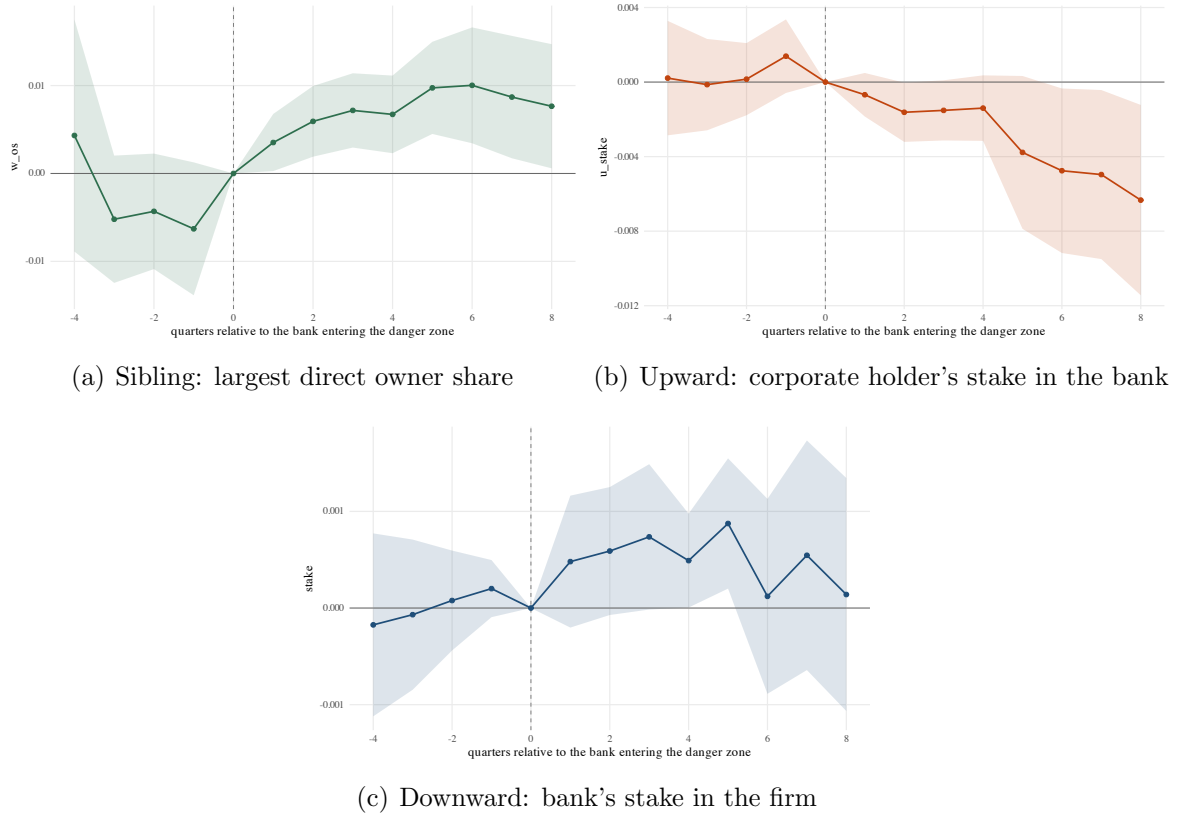
4.3 Firm accounts in the ownership samples

The firm analysis takes the non-bank firms in the same three ownership samples: firms held by banks, corporate holders of banks, and sibling firms held by bank owners. Its unit should be a firm-year within each sample, with repeated appearances through several ownership links consolidated before estimation. A firm linked to more than one entering bank should receive a single, pre-specified event date within that sample; the samples themselves may overlap. Outcomes use the log, log-plus-one and inverse-hyperbolic-sine transformations defined in Section 3.6. Because statements are annual, the entry-year estimate may include months before the bank's event.

The available plots cover downstream and sibling firms (Figures 8 and 9). The corporate-bank-holder sample has not yet been estimated. Both existing firm-account runs retain linked-pair-year observations, so a firm can receive weight through more than one link. The figures are therefore not yet a fully harmonised three-sample firm-year exercise.

Neither plotted sample shows a statistically clear average total-asset response. Downstream firms do show later contraction: three years after entry, total assets are about 0.33 log points lower and liabilities about 0.42 log points lower than those of comparison firms. Among siblings, book equity rises in the summary estimates, while average total-asset growth is not established. The non-current-asset path is especially difficult to attribute to entry because its pre-entry test

Figure 7. Ownership stakes around a bank's entry into the danger zone



Note: Existing quarterly event-study estimates. Downward and upward panels show ownership-pair stakes; the current sibling panel uses the maximum direct owner share per sibling firm-quarter and must be rebuilt for the intended owner-firm integrated stake. The outcome is plotted as a fraction of the held entity's equity (0.01 equals one percentage point). The stored horizon places entry at 1 and the omitted pre-entry reference at 0; negative values are placebos and the vertical line marks the reference. Shaded regions are 95% confidence intervals. Entering units at the first effect number 3,764 (downward), 841 (upward) and 637 (sibling); the unit and clustering of the sibling run differ from the intended pair design.

rejects parallel trends; equity also shows some earlier movement. The firm accounts therefore provide, at most, partial corroboration of the ownership result.

4.4 Putting the three levels together

The results need not mirror one another. Corporate lending by the bank covers many firms it does not own, so more corporate lending need not raise assets among downstream firms. A higher sibling stake can arise from buying existing shares rather than injecting cash; a rise in sibling equity can also accompany debt repayment or changes in valuation without expanding total assets. Bank, pair and firm analyses use different frequencies, samples and weights. They do not trace opposite sides of an observed transfer.

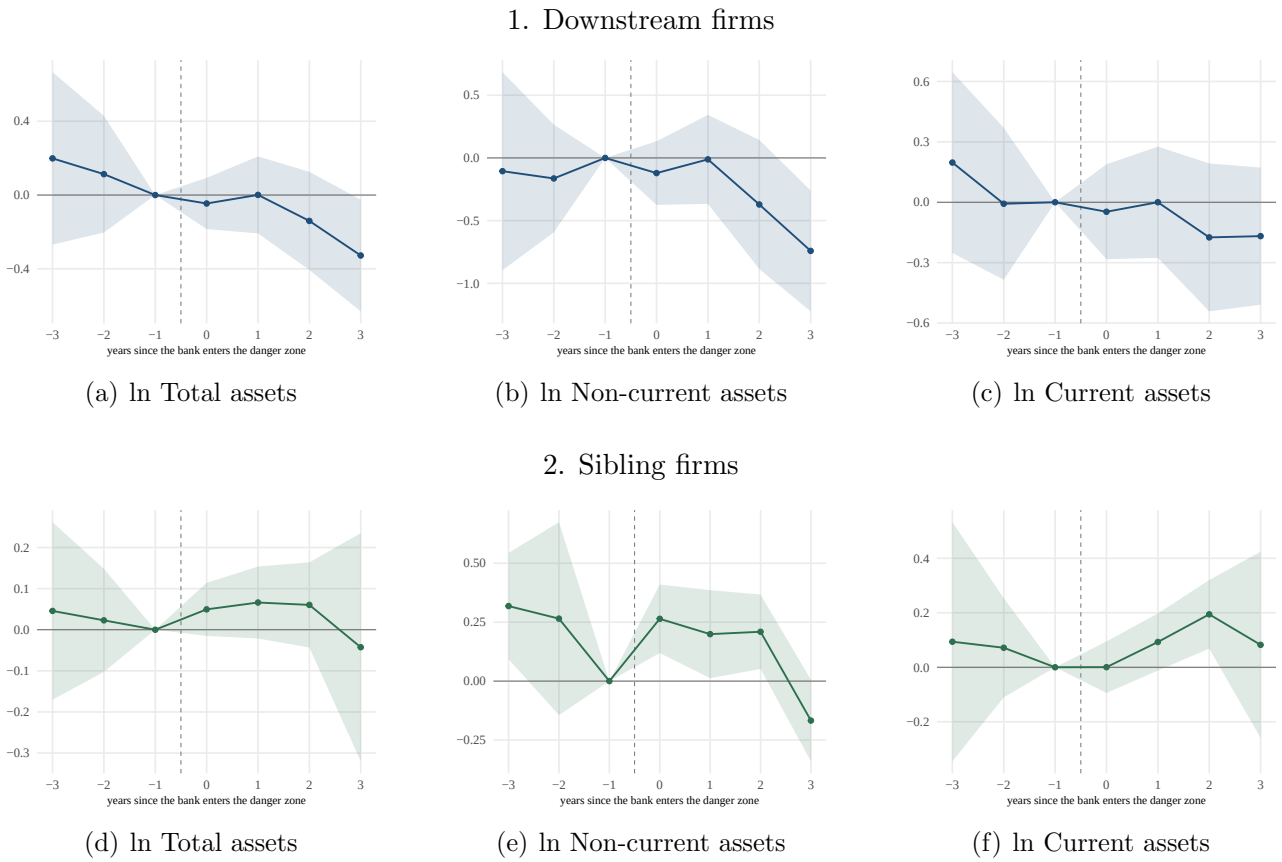
The present plots suggest different bank-adjustment paths across ownership-network groups and an increase in the sibling direct-share measure. It does not yet establish a corresponding expansion of those firms, a withdrawal by bank owners, or a transfer that shields assets from supervision. The most useful next step is to align bank, owner and firm samples on the same event dates, complete the corporate-holder firm analysis, and test cross-group differences directly. Until those checks are complete, the three designs locate possible adjustment but cannot identify its financing or purpose.

5 Conclusion

Bank ownership networks reveal potential margins of adjustment that bank accounts alone cannot locate. In the Russian setting, the current event-study plots suggest different balance-sheet paths for banks with greater and smaller pre-regime network reach. The clearest ownership result is an increase in the sibling direct-share measure. Upward and downward stakes are less conclusive, and the available firm-account estimates do not show a clear average expansion of total assets.

These findings are compatible with portfolio reorganisation but do not trace a transfer from a bank to its owners' firms. A purchase of existing shares can raise an ownership stake without financing the firm, while a bank's corporate lending can grow outside its ownership network. Differences in samples, timing and measurement further limit a joint interpretation. The evidence therefore does not establish that networks shield value from supervision or weaken

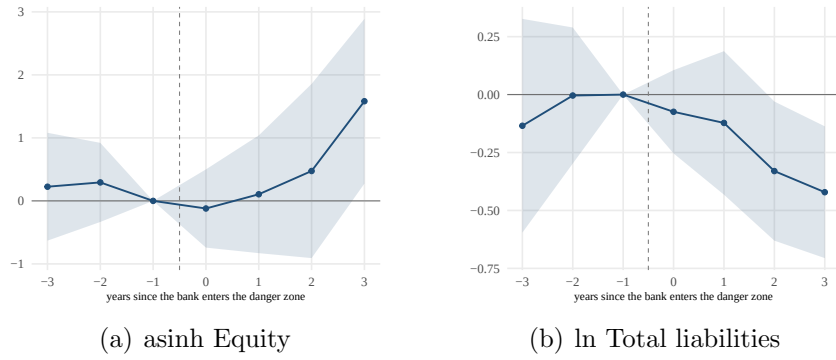
Figure 8. Firm assets around a bank's entry into the danger zone



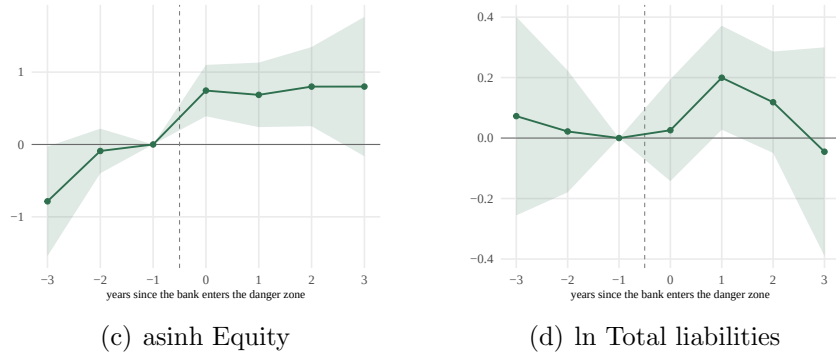
Note: Existing annual event-study estimates. Event year 0 contains the bank's first entry; year -1 is the reference and the vertical line falls between the two years. Shaded regions retain the uncertainty bands of the saved estimates. Observations are linked pair-years, not necessarily unique firm-years. Labels use " $\ln$ " as shorthand; current and non-current assets use $\ln(1+x)$. The corporate-bank-holder sample is not yet available.

Figure 9. Firm equity and liabilities around a bank's entry into the danger zone

1. Downstream firms



2. Sibling firms



Note: Existing annual event-study estimates for downstream and sibling firms. Event year 0 contains the bank's first entry; year -1 is the reference. Equity is measured in inverse-hyperbolic-sine units, not percentage changes. Observations are linked pair-years. Liabilities use $\ln(1 + x)$; shaded regions retain the saved uncertainty bands. Corporate-bank-holder outcomes are not yet estimated.

enforcement.

The central empirical priority is to align the three levels of analysis: construct risk scores using only information available at each date, apply common eligibility and event rules, retain complete ownership exits, and consolidate firm observations before completing the corporate-holder sample. Formal comparisons across network groups and direct evidence on connected transactions would then help distinguish compliance, ordinary balance-sheet adjustment and transfers to affiliated entities.

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